BOARD QUESTION PAPER : FEBRUARY 2026

MATHEMATICS AND STATISTICS

Time: 3 Hrs. **Max. Marks: 80**

General instructions:

*The question paper is divided into **FOUR** sections.*

(1) ***Section A:*** *Q. 1 contains **Eight** multiple choice type questions, each carrying **Two** marks.*
*Q. 2 contains **Four** very short answer type questions, each carrying **One** mark.*

(2) ***Section B:*** *Q.3 to Q. 14 contain **Twelve** short answer type questions, each carrying **Two** marks. (Attempt any **Eight**)*

(3) ***Section C:*** *Q.15 to Q.26 contains **Twelve** short answer type questions, each carrying **Three** marks. (Attempt any **Eight**)*

(4) ***Section D:*** *Q.27 to Q.34 contains **Eight** long answer type questions, each carrying **Four** marks. (Attempt any **Five**)*

(5) *Use of log table is allowed. Use of calculator is not allowed.*

(6) *Figures to the right indicate full marks.*

(7) *Use of graph paper is not necessary. Only rough sketch of graph is expected.*

(8) *For each multiple choice type of questions, only the first attempt will be considered for evaluation.*

(9) *Start answer to each section on a new page.*

SECTION – A

Q.1. Select and write the correct answer for the following multiple choice type of questions: **[16]**

i. The converse of contrapositive of $\sim p \rightarrow q$ is _____. (2)

(a) $q \rightarrow p$ (b) $\sim q \rightarrow p$ (c) $p \rightarrow \sim q$ (d) $\sim q \rightarrow \sim p$

ii. If $A = \begin{bmatrix} 2 & -4 \\ 3 & 1 \end{bmatrix}$, then the adjoint of matrix A is _____ . (2)

(a) $\begin{bmatrix} 1 & 3 \\ 4 & -2 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 3 \\ -4 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & -3 \\ -4 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 4 \\ -3 & 2 \end{bmatrix}$

iii. If $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$, then $x =$ _____ (2)

(a) -1 (b) $\frac{1}{6}$ (c) $\frac{1}{3}$ (d) $\frac{3}{2}$

iv. The angle between the line $\bar{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} + \hat{j} + \hat{k})$ and the plane $\bar{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 8$ is _____ (2)

(a) $\sin^{-1}\left(\frac{\sqrt{2}}{3}\right)$ (b) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (c) $\sin^{-1}\left(\frac{1}{2}\right)$ (d) $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

v. If $y = \sec(\tan^{-1}x)$, then $\frac{dy}{dx}$ at $x = 1$ is _____ . (2)

(a) $\frac{1}{2}$ (b) 1 (c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$

vi. The approximate value of the function $f(x) = x^3 - 3x + 5$ at $x = 1.99$ is _____ . (2)

(a) 6.09 (b) 6.91 (c) 7.09 (d) 7.91

vii. $\int_1^2 \frac{1}{x^2} e^{\frac{1}{x}} dx =$ _____ . (2)

(a) $\sqrt{e} + 1$ (b) $\sqrt{e} - 1$ (c) $\sqrt{e}(\sqrt{e} - 1)$ (d) $\frac{\sqrt{e} - 1}{e}$

viii. If the p.d.f. of a continuous r.v. X is

$f(x) = \frac{x+2}{18}$, for $-2 < x < 4$

$= 0$, otherwise

then $P(|X| < 1) =$____ (2)

(a) $\frac{1}{9}$ (b) $\frac{2}{9}$ (c) $\frac{1}{27}$ (d) $\frac{2}{27}$

Q.2. Answer the following questions: **[4]**

i. Write the dual of $(p \vee q) \vee r \equiv p \vee (q \vee r)$ (1)

ii. Evaluate: $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$ (1)

iii. Evaluate: $\int \frac{2x}{1+x^2}\, dx$ (1)

iv. Write the degree of the differential equation $(y''')^2 + 3(y'')^3 + 3xy' + 5y = 0$ (1)

SECTION – B

Attempt any EIGHT of the following questions: **[16]**

Q.3. Construct the switching circuit of the statement pattern $(\sim p \wedge q) \vee (p \wedge \sim r)$ (2)

Q.4. In ΔABC, prove that $a(b\cos C - c\cos B) = b^2 - c^2$ (2)

Q.5. Find the general solution of $4\cos^2\theta = 3$. (2)

Q.6. Find k, if the sum of the slopes of the lines represented by $x^2 + kxy - 3y^2 = 0$ is twice their product. (2)

Q.7. Find the value of p, for which the vectors $\bar{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\bar{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are perpendicular to each other. (2)

Q.8. Find the vector equation of the line passing through the points A(1, 2, 3) and B(2, 3, 4). (2)

Q.9. Find $\frac{dy}{dx}$, if $\sqrt{x} + \sqrt{y} = \sqrt{a}$. (2)

Q.10. Find $\frac{d^2y}{dx^2}$, if $y = x^3 + 7x^2 - 2x - 9$. (2)

Q.11. Test whether the function $f(x) = x^2 + 6x^2 + 12x - 7$ is increasing or decreasing for all $x \in R$. (2)

Q.12. A stone is dropped into a quiet lake and waves in the form of circles are generated. Radius of the circular wave increases at the rate of 3 cm/sec. How fast the area enclosed is increasing when the radius is 8 cm? (2)

Q.13. Evaluate: $\int \sqrt{1 + \sin 2x}\, dx$ (2)

Q.14. Given that X~B (n, p), if n = 10, E(X) = 8 then find Var(X). (2)

SECTION – C

Attempt any EIGHT of the following questions: **[24]**

Q.15. Examine whether the statement pattern $(p \wedge q) \wedge (\sim p \vee \sim q)$ is a tautology or contradiction or contingency. (3)

Q.16. In ΔABC, if $A = 45^\circ$, $B = 60^\circ$ then find the ratio of its sides. (3)

Q.17. If two vertices of a triangle are A(3, 1, 4) and B(–4, 5, –3) and the centroid of the triangle is G(–1, 2, 1), then find the coordinates of the third vertex C of the triangle. (3)

Q.18. If D, E, F are the mid-points of the sides BC, CA, AB respectively of ΔABC, then prove that $\overline{AD} + \overline{BE} + \overline{CF} = \bar{0}$. (3)

Q.19. Show that the lines $\bar{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(2\hat{i} - 2\hat{j} + \hat{k})$ and $\bar{r} = (4\hat{i} - 3\hat{j} + 2\hat{k}) + \mu(\hat{i} - 2\hat{j} + 2\hat{k})$ intersect each other. (3)

Q.20. Find the cartesian equation of the plane $\bar{r} = (\hat{i} - \hat{j}) + \lambda(\hat{i} + \hat{j} + \hat{k}) + \mu(\hat{i} - 2\hat{j} + 3\hat{k})$. (3)

Q.21. If $y = f(u)$ is a differentiable function of u and $u = g(x)$ is a differentiable function of x, then prove that y is a differentiable function of x and $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$. (3)

Q.22. Verify LMVT for the function $f(x) = \log x$, on [1, e]. (3)

Q.23. Evaluate: $\int \frac{\sin x}{\sin 3x}\,dx$ (3)

Q.24. Solve the D.E. $3e^x \tan y\,dx + (1 + e^x)\sec^2 y\,dy = 0$. (3)

Q.25. Find E(X) and V(X), where X is the number obtained on uppermost face, when a fair die is thrown. (3)

Q.26. A pair of dice is thrown 4 times. If getting a doublet is considered as success, find the probability of two successes. (3)

SECTION – D

Attempt any FIVE of the following questions: **[20]**

Q.27. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, prove that $A \cdot (\text{adj } A) = (\text{adj } A) \cdot A = |A| \cdot I$ (4)

Q.28. Show that every homogeneous equation of degree two in x and y, i.e. $ax^2 + 2hxy + by^2 = 0$, represents a pair of lines passing through the origin, if $h^2 - ab \geq 0$ (4)

Q.29. If $A(\bar{a})$ and $B(\bar{b})$ are any two points in space and $R(\bar{r})$ be a point on the line segment AB dividing internally in the ratio m : n, then prove that $(\bar{r}) = \frac{m\bar{b} + n\bar{a}}{m + n}$ (4)

Q.30. Solve the L.P.P. graphically:
Minimize $z = 5x + 2y$,
Subject to $5x + y \geq 10$, $x + y \geq 6$, $x \geq 0, y \geq 0$ (4)

Q.31. Evaluate: $\int \frac{3x^2 + 4x - 5}{(x^2 - 1)(x + 2)}\,dx$ (4)

Q.32. Prove that: $\int_a^b f(x)\,dx = \int_a^b f(a + b - x)\,dx$

Hence, find $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sin^2 x\,dx$ (4)

Q.33. Find the area enclosed between the circle $x^2 + y^2 = 1$ and the line $x + y = 1$ lying in the first quadrant. (4)

Q.34. Solve the differential equation $x^2 \frac{dy}{dx} = x^2 + xy + y^2$. (4)